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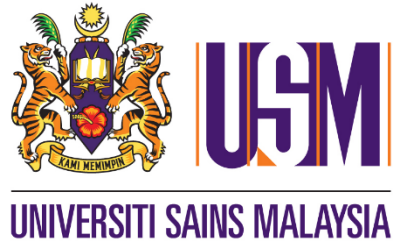
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DEVELOPMENT OF FERMENTED WATER KEFIR AMARANTH DRINK

by

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A dissertation submitted in partial fulfillment of the requirement for the degree of
Bachelor of Technology (B. Tech) in the field of Food Technology
School of Industrial Technology
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DECLARATION BY AUTHOR

This dissertation is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. The content of my dissertation is the result of work I have carried out since the commencement of my research project and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution.

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CHIN WEN YI

JULY 2020

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENT	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATIONS	x
LIST OF APPENDICES	xiii
ABSTRAK	xiv
ABSTRACT	xv
CHAPTER 1 INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	3
1.3 Objectives	4
CHAPTER 2 LITERATURE REVIEW	5
2.1 Amaranths	5
2.1.1 General Description of Amaranths	5
2.1.2 Health benefits of Vegetable Amaranth	6
2.1.3 Nutritional Composition and Health Benefit of Vegetable Amaranths (<i>Amaranthus tricolor</i> and <i>Amaranthus blitum</i>)	8
2.2 Functional Drinks	9
2.3 Probiotics	11
2.4 Water kefir	12
2.4.1 Water Kefir Grains	12

2.4.2 Water kefir drinks	15
2.4.3 Health Benefits of Water Kefir	16
2.4.4 Fermentation Process of Water Kefir	18
CHAPTER 3 MATERIALS AND METHOD	20
3.1 Design of Experiment	20
3.2 Preliminary Study	21
3.3 Materials	21
3.4 Preparation of Red and Green Amaranth Vegetable Juice	21
3.5 Fermentation of Water Kefir Grains(Process to Activate Water Kefir Grains)	22
3.6 Preparation of Fermented Water Kefir Amaranth Drinks	22
3.7 Physicochemical Analysis	23
3.7.1 pH Value	23
3.7.2 Total Soluble Solids	23
3.7.3 Sugar Composition	23
3.7.3a Sample Preparation	24
3.7.3b Standard Solution Preparation	24
3.7.3c Determination of Sugar Composition Using High Performance Liquid Chromatography	24
3.7.4 Total Phenolic Content	25
3.7.4a Sample Extracts Preparation	25
3.7.4b Standard Solutions Preparation	25
3.7.4c Folin-Ciocalteu Assay	26
3.7.5 Antioxidant Activity	26
3.7.5a Sample Extracts Preparation	26

3.7.5b DPPH Assay	27
3.7.6 Titratable Acidity	27
3.8 Microbiological Analysis	28
3.8.1 Serial Dilution	28
3.8.2 Preparation of Agar Medium	28
3.8.2a Plate Count Agar (PCA)	28
3.8.2b Potato Dextrose Agar (PDA)	28
3.8.2c De Man, Rogosa, Sharpe (MRS) Agar	29
3.8.2d Eosin Methylene Blue (EMB) Agar	29
3.8.3 Preparation of Broth Medium	29
3.8.3a Lauryl Tryptose (LST) Broth	29
3.8.3b Brilliant Green Bile (BGLB) Broth	29
3.8.3c EC (<i>Escherichia coli</i>) Broth	29
3.8.4 Bacteria Enumeration and Plate Counting	30
3.8.4a Colony Forming Unit and Calculation	30
3.8.4b Total Plate Count	30
3.8.4c Yeast and Mould Count	30
3.8.4d Lactobacilli count	31
3.8.5 Isolation and Enumeration of Total Coliforms, Fecal Coliforms and <i>Escherichia coli</i>	31
3.8.5a Most Probable Number (MPN) Technique	31
3.8.5b Presumptive Test for Total Coliforms and Fecal Coliforms	32
3.8.5c Confirmatory Test for Total Coliforms	32
3.8.5d Confirmatory Test for Fecal Coliforms	32

3.8.5e Escherichia coli Test	33
3.9 Storage Studies	33
3.9.1 Lactobacilli Count	33
3.9.2 pH Value	33
3.10 Statistical Analysis	34
CHAPTER 4 RESULTS AND DISCUSSIONS	35
4.1 Preliminary Test	35
4.2 Physicochemical Analysis	35
4.2.1 pH value	35
4.2.2 Total soluble solids	37
4.2.3 Sugar composition	39
4.2.4 Total phenolic content	43
4.2.5 Antioxidant activity	45
4.2.6 Titratable acidity	47
4.3 Microbiological analysis	48
4.3.1 Total plate count	49
4.3.2 Lactobacilli count	50
4.3.3 Yeast and mould count	52
4.3.4 Total coliforms	53
4.3.5 Fecal coliforms	54
4.4 Storage study	55
4.4.1 pH	55
4.4.2 Lactobacilli count	57
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS	59

REFERENCES	61
APPENDICES	76

LIST OF TABLES

Table Caption	Page
3.6 Abbreviation of the fermented water kefir amaranth drinks and their controls	23
4.1 Abbreviation of the fermented water kefir amaranth drinks and their controls	35
4.2.1 pH values of fermented drinks and their respective controls	36
4.2.2 Total soluble solids of fermented samples and their respective controls	39
4.2.3 Sugar composition of fermented amaranth samples and their respective controls	40
4.2.4 Total phenolic contents of fermented samples and their respective controls	44
4.2.5 Antioxidant activity of fermented drinks and their respective controls expressed as percentage of DPPH radical scavenging activity	46
4.2.6 Titratable acidity of fermented samples and their respective controls	48
4.3.1 Total plate count of fermented samples and their respective controls	49
4.3.2 Lactobacilli count of fermented samples	51
4.3.3 Yeast and mold count of fermented samples and their respective controls	53
4.3.4 Total coliform count of fermented samples and their respective controls	54
4.3.5 Fecal coliform count of fermented samples and their respective controls	55

LIST OF FIGURES

Figure Caption	Page
3.1 Development of fermented water kefir amaranth drinks	20
4.4.1 pH values of fermented samples and their respective controls during two weeks of storage at 4°C	57
4.4.2 Lactobacilli count of fermented samples and their respective controls during two weeks of storage at 4°C.	58

LIST OF ABBREVIATIONS

Abbreviation	Caption
°C	Degree Celsius
α	alpha
β	beta
μm	micrometer
μL	microliter
AOAC	Association of Official Analytical Chemists
ANOVA	Analysis of Variance
BGLB	Brilliant Green Bile Agar
CaEDTA	Calcium disodium edetate
CFU	Colony Forming Unit
CFU/mL	Colony Forming Units per milliliter
EC	<i>Escherichia coli</i> Broth
EMB	Eosin Methylene Blue Agar
g	gram
GC5	Fermented green amaranth without water kefir grains with 5% brown sugar
GC7	Fermented green amaranth without water kefir grains with 7% brown sugar
GK5	Fermented green amaranth with water kefir grains with 5% brown sugar
GK7	Fermented green amaranth with water kefir grains with 7% brown sugar
HPLC	High-performance liquid chromatography

hr	hour
L	liter
LST	Lauryl Tryptose Broth
M	molarity
min	minute
mg	milligram
mg GAE/100g	milligram of gallic acid equivalents per 100 g
mL	milliliter
mL/min	milliliter per minute
mm	millimeter
mmHg	millimeter of mercury
MPN	Most probable number
MRS	De man, Rogosa, Sharpe Agar
Na ₂ CO ₃	sodium carbonate
NaOH	sodium hydroxide
PCA	Plate Count Agar
PDA	Potato Dextrose Agar
RC5	Fermented red amaranth without water kefir grains with 5% brown sugar
RC7	Fermented red amaranth without water kefir grains with 7% brown sugar
RK5	Fermented red amaranth with water kefir grains with 5% brown sugar
RK7	Fermented red amaranth with water kefir grains with 7% brown sugar

UV-Vis

Ultraviolet-visible

w/v

mass/volume

LIST OF APPENDICES

APPENDIX A	Preliminary Test
APPENDIX B	Standard Curve of Sugar Analysis
APPENDIX C	Standard Curve of Total Phenolic Content Analysis
APPENDIX D	MPN Index Table

PENGHASILAN MINUMAN KEFIR AIR BAYAM

ABSTRAK

Tujuan kajian ini adalah untuk menghasilkan minuman kefir air dari jus bayam sebagai alternatif untuk vegetarian dan pengguna yang mempunyai intoleransi laktosa bagi menggantikan minuman berasas susu haiwan. Pelbagai analisis telah dijalankan ke atas minuman kefir air bayam merah (*Amaranthus tricolor*) dan bayam hijau (*Amaranthus blitum*) yang difermentasi dengan tahap gula (5% dan 7%) yang terpilih. Kedua-dua minuman kefir air bayam merah dan hijau mencapai penurunan signifikan ($p < 0.05$) dalam nilai pH, jumlah pepejal larut dan tahap sukrosa menunjukkan proses fermentasi yang berkesan. Minuman kefir air bayam merah yang difermentasi menggunakan 5% tahap gula menunjukkan peningkatan signifikan ($p < 0.05$) dalam aktiviti antioksidan dan kandungan jumlah fenolik telah mengenalpastikan kandungan nutrisi yang tinggi. Kedua-dua minuman kefir air bayam merah dan hijau dapat klaim properti probiotik disebabkan pencapaian minima 10^6 CFU/mL lactobacilli lepas 2 minggu penyimpanan. Keputusan dari analisis mikrobiologi telah menunjukkan lactobacilli (13.39×10^6 CFU/mL) dan yis dan kulat (25.23×10^6 CFU/mL) dalam minuman kefir air bayam merah yang difermentasi menggunakan 7% tahap gula jauh lebih tinggi berbanding bayam hijau. Kedua-dua sampel mempunyai kandungan coliform yang dalam julat selamat dan ketiadaan coliform fecal telah menunjukkan kualiti mikrobiologi yang stabil. Namun begitu, jus bayam merah dan hijau tidak sepenuhnya sesuai sebagai substrat minuman kefir air disebabkan keasidan tertitrat dan kiraan sel boleh hidup yang rendah. Kesimpulannya, minuman kefir air bayam merah dan bayam hijau telah berjaya dihasilkan.

DEVELOPMENT OF FERMENTED WATER KEFIR AMARANTH DRINK

ABSTRACT

The aim of this study is to develop fermented water kefir drink from vegetable amaranth juice as an alternative for vegetarians and lactose intolerants to replace dairy beverages. Various analyses were conducted on fermented water kefir red amaranth (*Amaranthus tricolor*) and green amaranth (*Amaranthus blitum*) drinks fermented with selected sugar levels (5% and 7%). Both fermented red and green amaranth samples with 7% sugar achieved significant ($p < 0.05$) decrement in pH value, total soluble solids, and sucrose concentration which represented efficient water kefir fermentation. Fermented red amaranth sample showed significant ($p > 0.05$) increment in antioxidants activity and total phenolic content after fermentation represented higher nutritional value. Both fermented red and green amaranth samples were able to claim probiotic properties due to the achievement of minimum 10^6 CFU/mL of lactobacillus after 2 weeks of storage. Results from microbiological analyses showed a significantly ($p < 0.05$) higher lactobacilli count (13.39×10^6 CFU/mL) and yeast and mold count (25.23×10^6 CFU/mL) in fermented red amaranth drink with 7% sugar level compared to green amaranth. Both samples had acceptable range of coliform count and absence of fecal coliforms represented the stable microbial quality. However, red and green amaranth vegetable juice were not fully suitable to use as water kefir substrate due to low titratable acidity and total viable cell count. As an overall, fermented red and green amaranth water kefir drinks were successfully produced.